SMART Briefing

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? Logistics System Modeling ? Integration of Program M&S with Information Systems Modeling (C4ISR, JTA-A, Army Enterprise Strategy) ? SMART as a Complement to Spiral Development ? SMART used to Reduce Test and Evaluation (virtual testing) ? Integration of SMART into Army & DoD Cost Models (POM Builds) ? SMART use of Process and Data Models ? HTI Validation through the use of SMART

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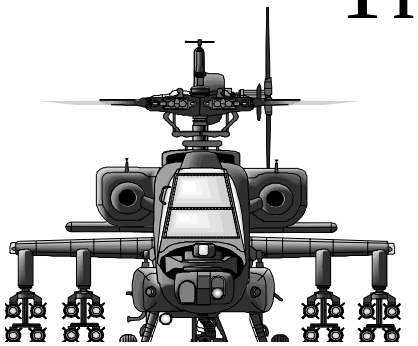
The AH-64D System

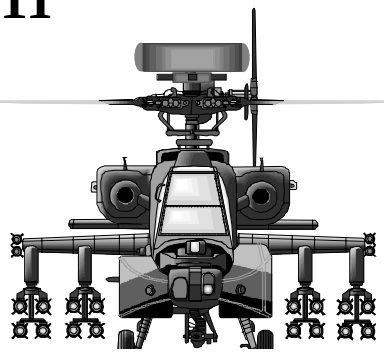


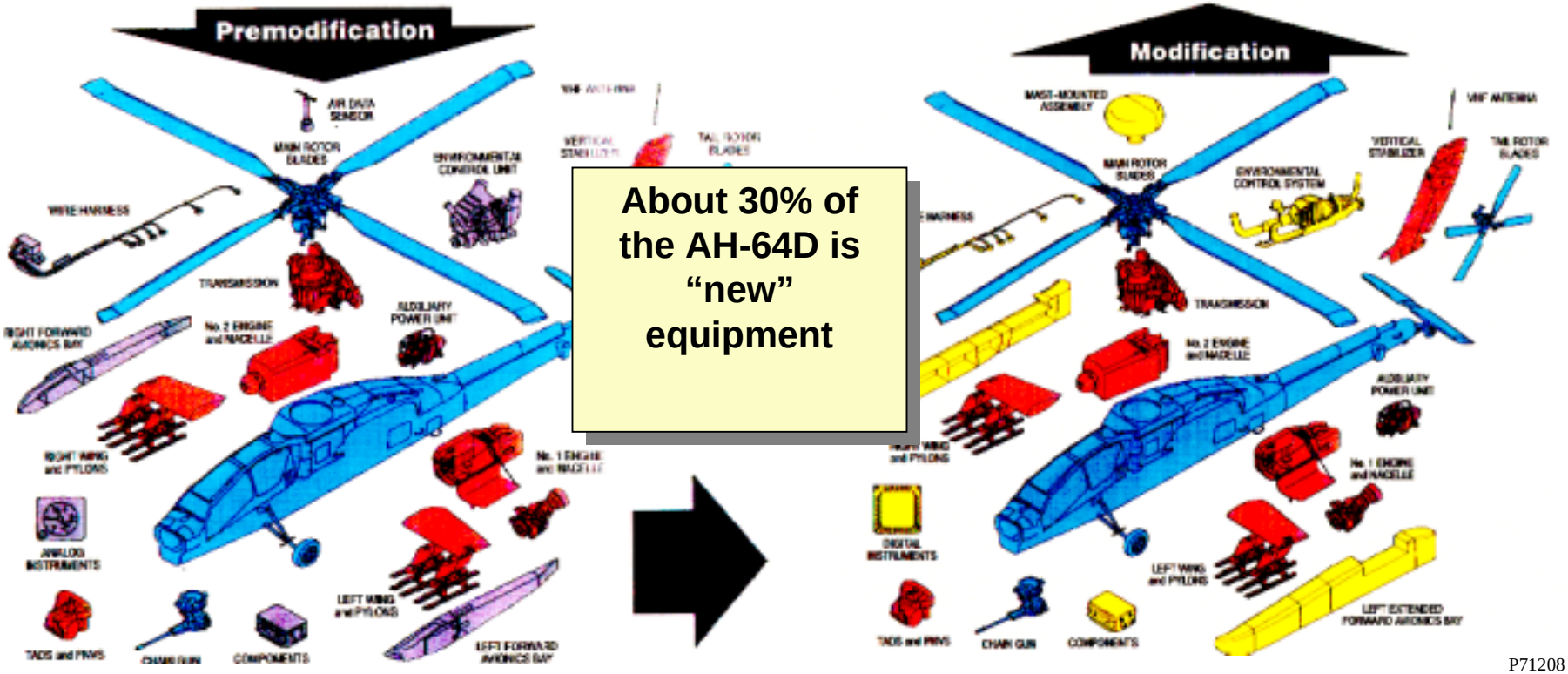
Use As-is

Modified

Excess

New



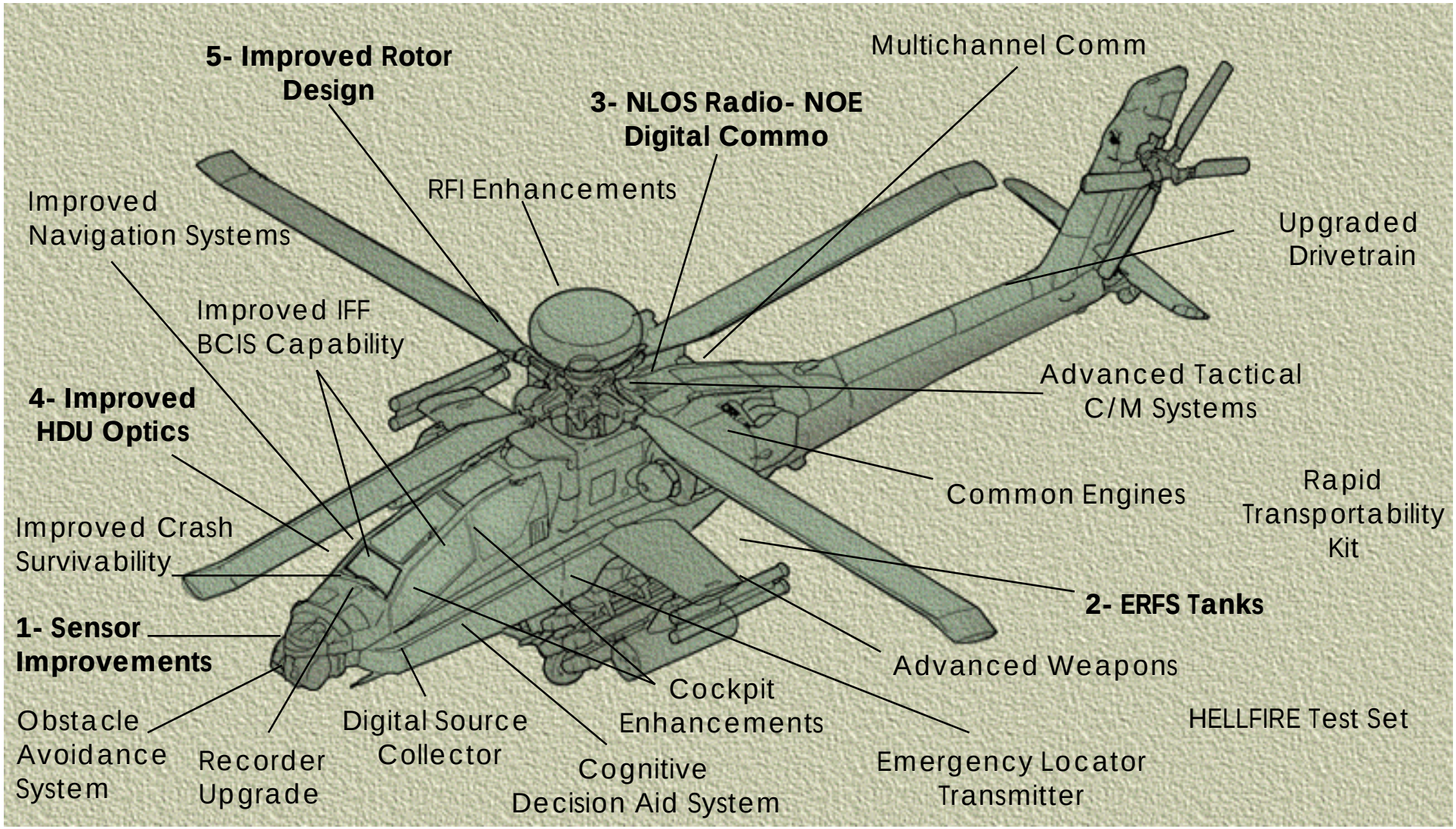


P71208

Sources of Improvements & Modifications

- Operational Capabilities Improvements & Priority List
- P3I List
- Funded Modifications
- Top Ten Cost Drivers
- Digitization
- Unfunded Requirements List
- Diminishing Mfg. Sources

Operational Capabilities Improvement Priority List



Operational Capabilities Improvement List

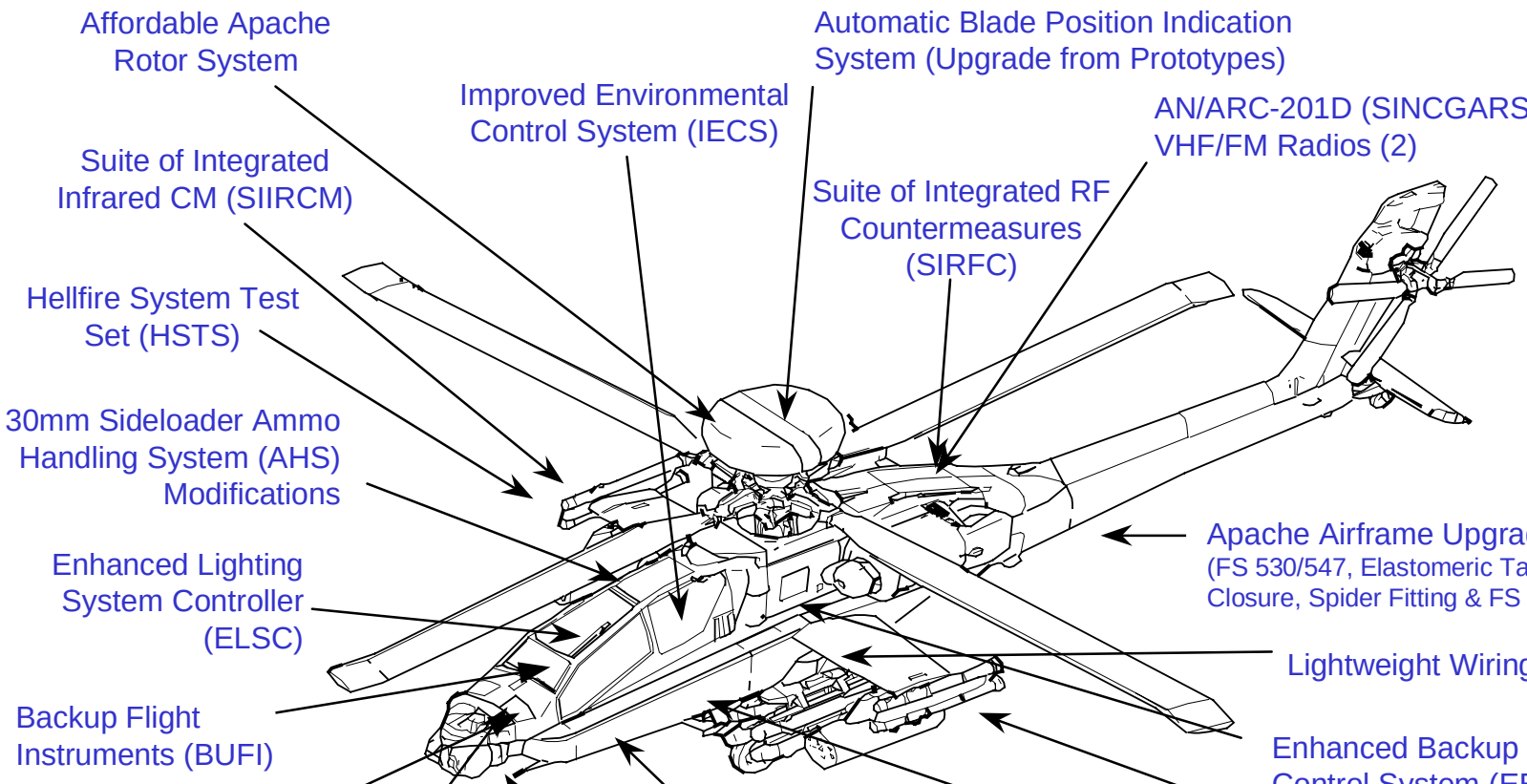
Fire Control Radar

- Algorithm Robustness Improvements
- Capability to Track Targets
- Air to Air Targeting
- Terrain Profile and Ground Map
- Unmasked Indicator

AH-64D Aircraft

- Sensor Improvements
- Extended Range Tanks
- NLOS Radio/Comm
- Improved HDU Optics
- Improved Rotor Design
- Upgraded Drivetrain
- Digital Map

Funded Modifications



Affordable Apache Rotor System

Automatic Blade Position Indication System (Upgrade from Prototypes)

Improved Environmental Control System (IECS)

AN/ARC-201D (SINCGARS SIP) VHF/FM Radios (2)

Suite of Integrated Infrared CM (SIIRCM)

Suite of Integrated RF Countermeasures (SIRFC)

Hellfire System Test Set (HSTS)

30mm Sideloader Ammo Handling System (AHS) Modifications

Apache Airframe Upgrades (AAU)
(FS 530/547, Elastomeric Tail mounts, Slot Closure, Spider Fitting & FS 176 Improvement)

Enhanced Lighting System Controller (ELSC)

Lightweight Wiring (LWW)

Backup Flight Instruments (BUFI)

Enhanced Backup Control System (EBUCS)

IOTE SW Upgrade

Improved Electrical Power Management System (IEPMS)

Tactical Engagement Simulation System (TESS)

Dual Embedded Global Positioning and Inertial Nav (EGI)

Improved Extended Forward Avionics Bays (IEFABS)

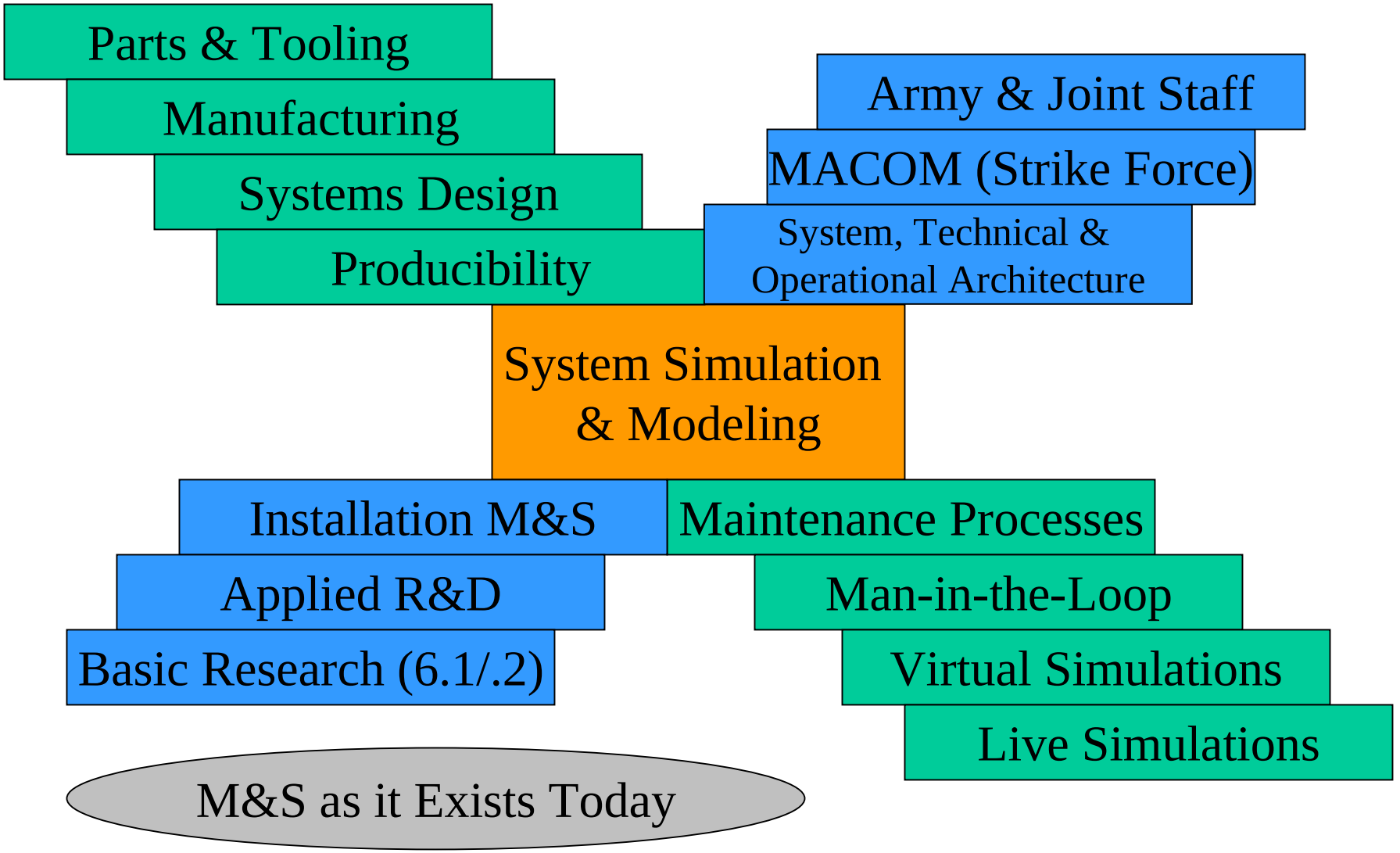
Alternate Laser Code (ALC)

Apache SMART Goals

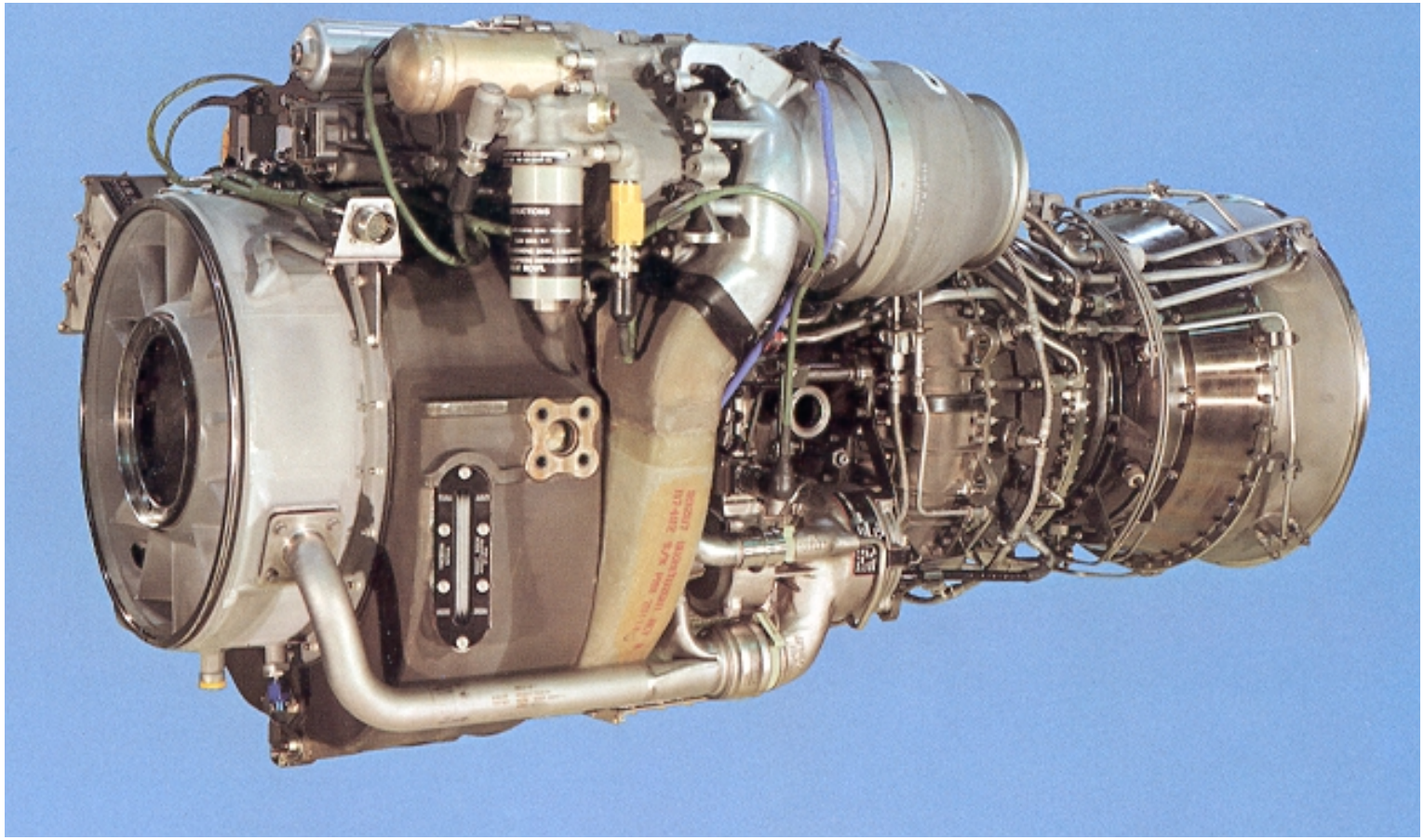
- 50% Reduction in Cycle Time
- 30% Reduction in Total Cost of Ownership
- Maximize use of Industry's Investment
- Integrate with Requirements Analysis & Funding
- Execute through Performance Based Contracts
- Establish Measurements and Thresholds of Success

"Better, Faster, Cheaper" has taken hold of the acquisition community. But I assure you that this is not simply a slogan. It is a fundamental blueprint for survival…
Dr. J. Gansler

Modeling and Simulation Efforts



General Electric's T-700 Engine



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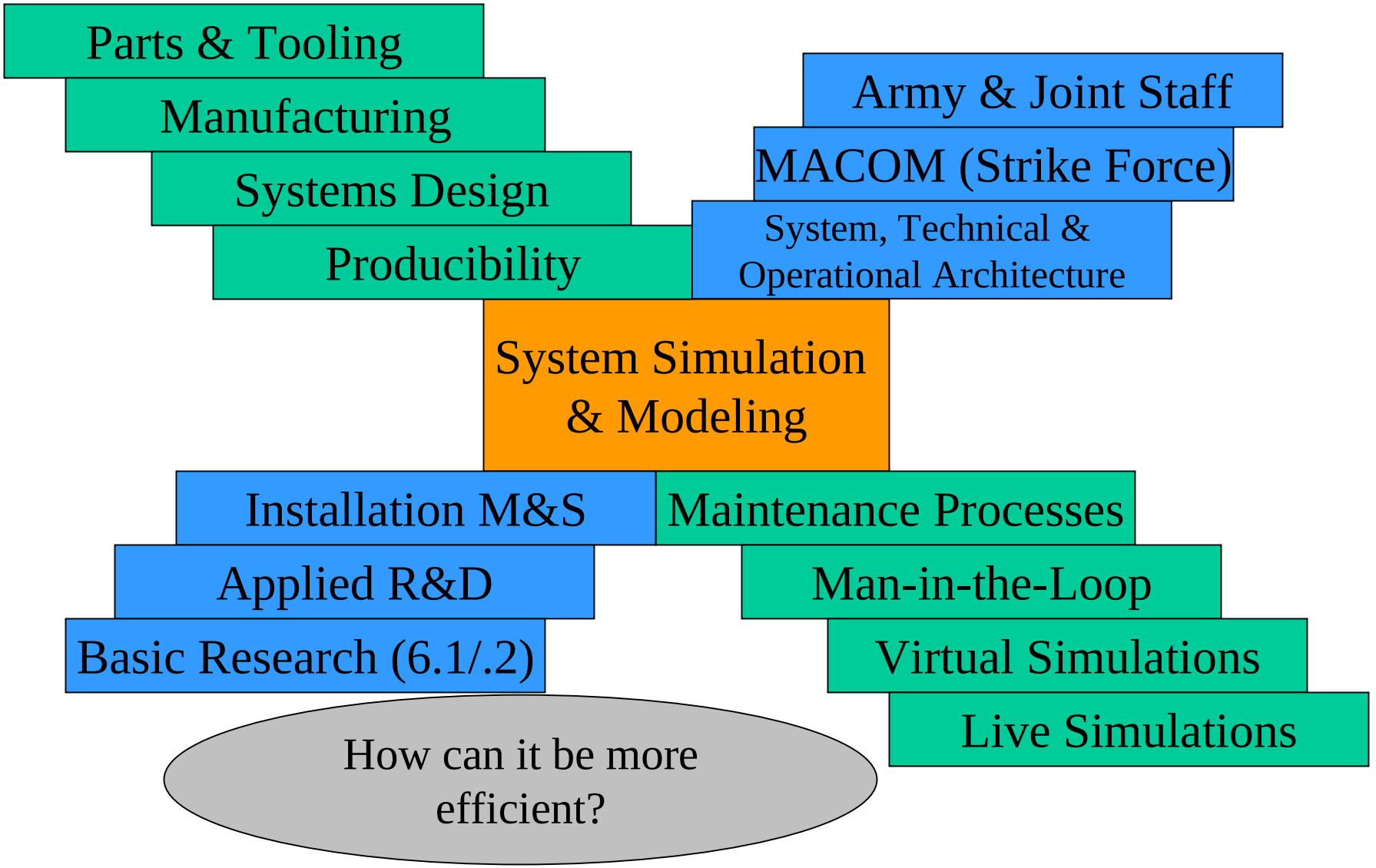
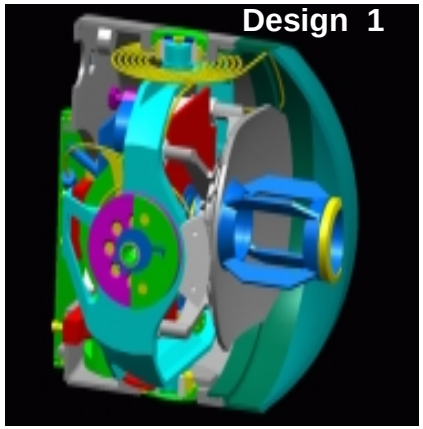
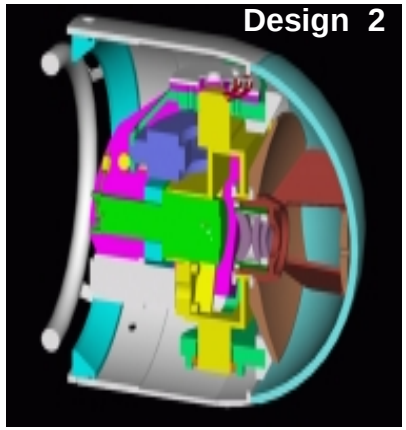


Lockheed Martin Electronics & Missile Systems

Development of an Adaptive Modeling Language (AML) for Knowledge-Based Engineering with Application to Interactive Gimbal Design (IGD)

	Optics	Mechanical	FE Analysis	Servo	Total
Design 1	1,082[1] hrs	4,955 hrs	1,214 hrs	1,383 hrs	8,634 hrs
Design 2	1,286 hrs	2,356 hrs	3,384 hrs	0 hrs	7,026 hrs





40:1 payback equals $6 million @ $100 per hour between design and maintenance

Systems Analysis

DADS animation output from Matrix-X to DADS Simulation

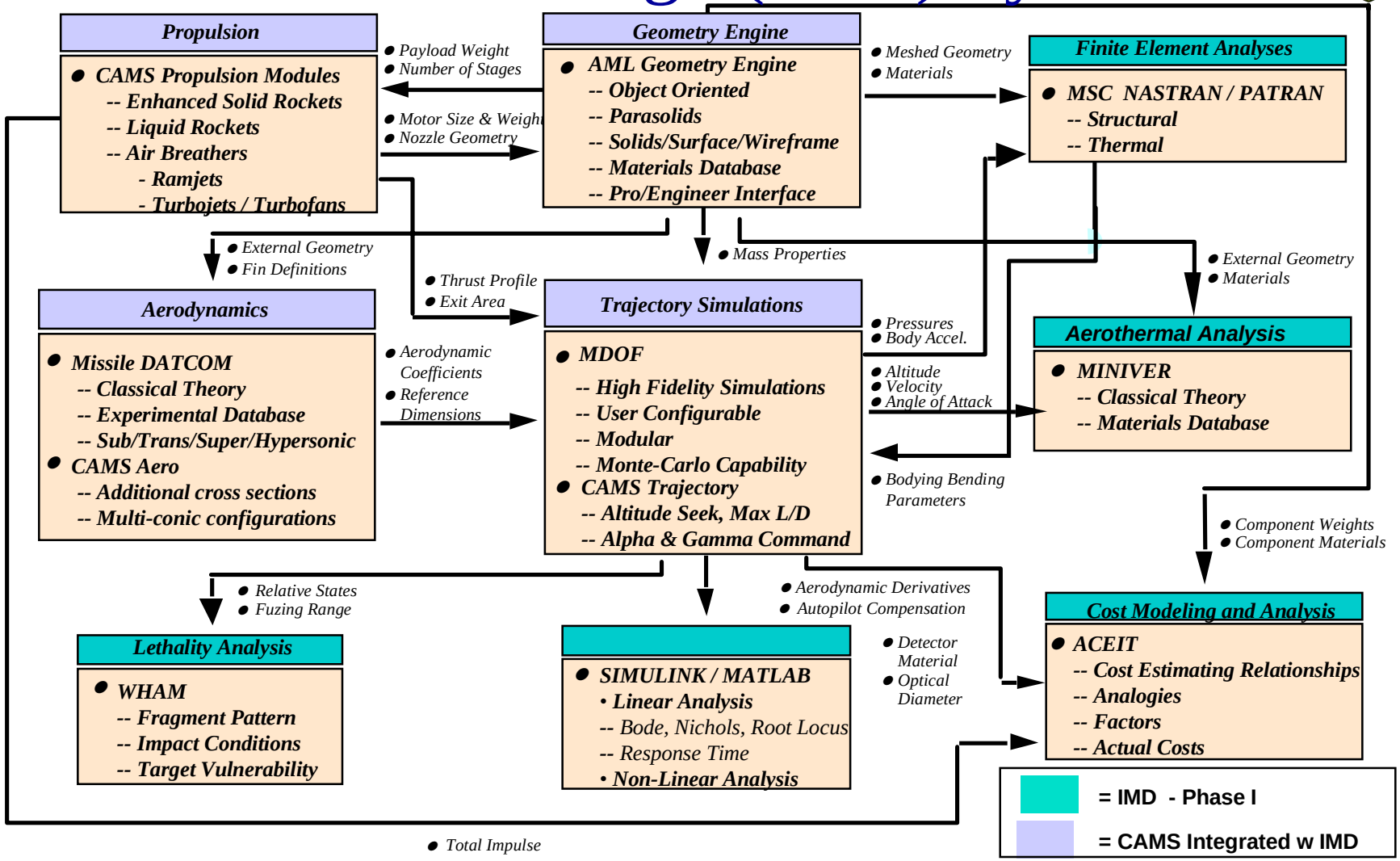
DADS Animation

Multi-view of DADS Output Position at 1.5 sec

Matrix-X Output

Time = 1.5 sec

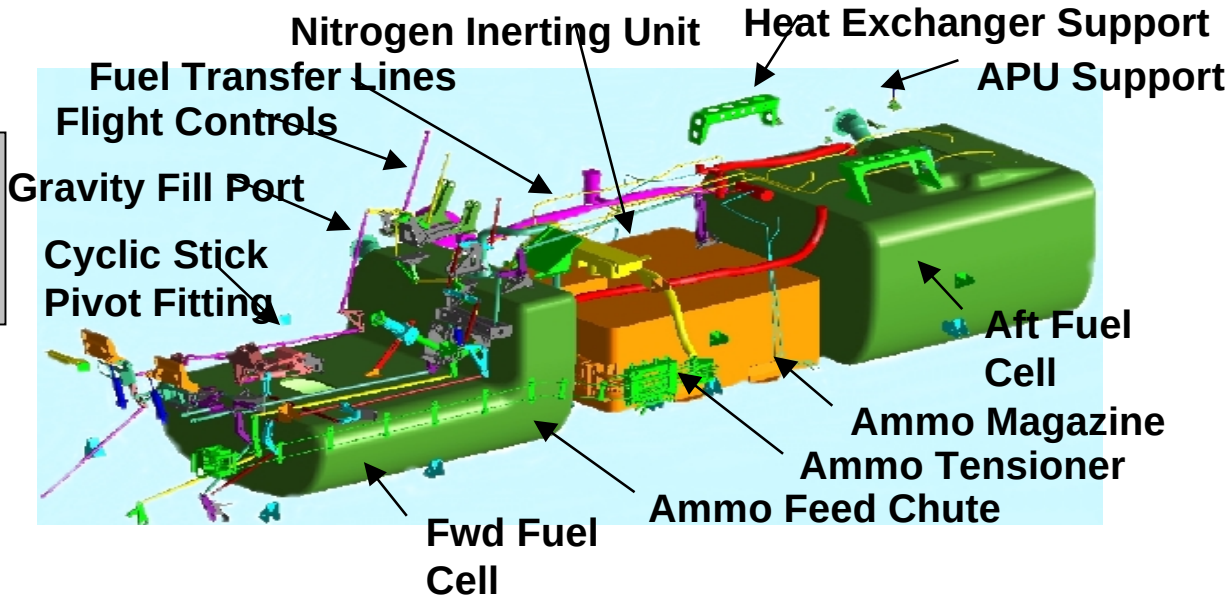
Overview: Interactive Missile Design (IMD) System



Boeing (McDonnell Douglas Helicopter Systems)

- **Rotary Wing Structures Technology Demonstration Program (RWSTDP)**
- **DMAPS — A Suite of VPD Tools for Integrated Product and Process Development (Design, Manufacturing and Producibility Simulation)**

SUBSYSTEMS IN CENTER FUSELAGE



Flow Chart Of DMAPS Process

Integrated Design and Analysis Tools

- Common Geometry Database
- Rapid Integrated Loads and Dynamics Development
- Feature Based Design and FEM
- Real-Time Cost/Weight Estimates

Enables Design for Affordability

Configuration Baseline

Conceptual Layouts

Assembly Layouts

Build/Buy/Support to Packages

Earlier Manufacturing Inputs

- Integrated 3-D Design/Tooling/ Manufacturing Assessments
- Manufacturing Simulations
- Factory Floor Simulations
- Cycle Time, Space, Labor, Inventory Assessments

Virtual Manufacturing Tools

Design Reviews make the IP / PD Process a Reality

Baseline	CLO	ALO	BTP

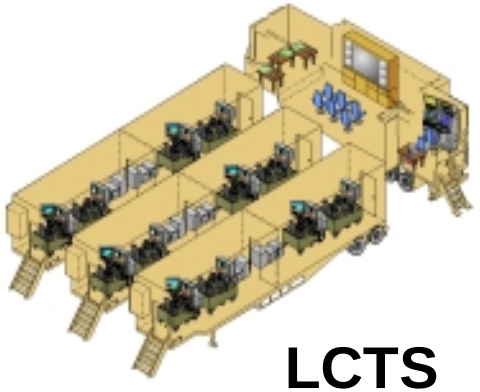
3-D Prototype

Objectives

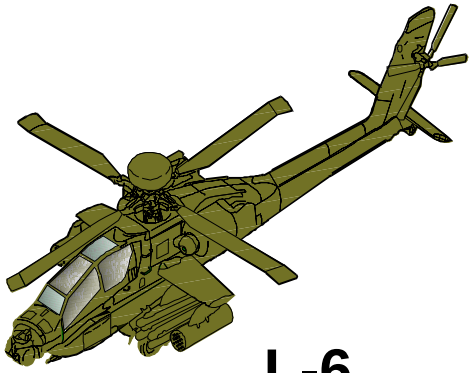
33 % Reduction in Design Cycle Time
25% Reduction in Design Personnel
33% Reduction in Manufacturing Cycle Time & Personnel
50% Reduction in Tooling Design and Fabrication Cost

Shortens the Design & Build Cycle Times and Improves First Time Quality

Apache Training Devices



LCTS



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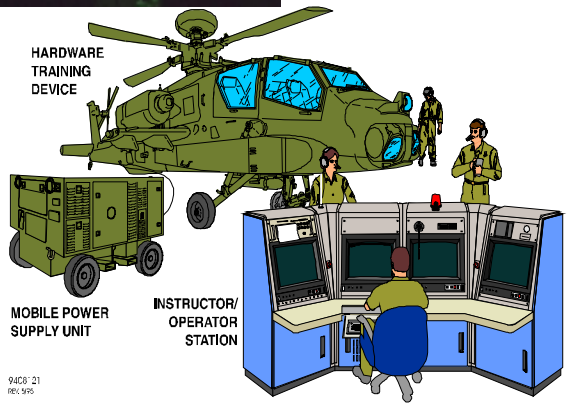


Applications of SMART/SBA

- Candidates are in the P3I, OCIPL, Top 10 Cost Driver, and UFR Lists
- Apache Program is 93-94% Committed to Multi-year Production Contracts
- High Priority Candidates

1) 2nd GEN FLIR
2) Embedded Battle Command & Integrated Data Modem (IDM)
3) Rotor Blade 2000
4) Longbow FCR on Comanche & Future Scout
5) SIRFC or ARC 220 (HF Radio)

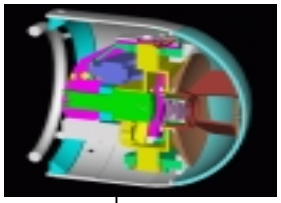
"Industry will do what the customer wants. Outcome is determined by the rules and not by emotion. We will respond; but, there has to be an incentive." Steven Conver, Lockheed Martin

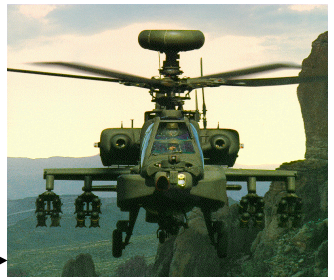
Observations

- Profitable Corporations use M&S profitably
  - But, M&S is a Corporate Asset and Guarded Carefully
- Industry will Mirror the Customer's Priorities and Organization
  - M&S is an overhead cost and industry would like to see more integration
- Expensive, High Risk (complex), High Visibility Programs Demand Proportionate M&S
- Industry concerns: 1) Staying Power of SMART/SBA;
  2) Existing Programs Poorly Compare to "Virtual Systems"

Conclusions

- M&S exists at every level in the program, both in the system and “environment”
- Industry has made a tremendous investment, and keeps investing for strategic advantage
- M&S is not well integrated, especially between design and operational trade-offs
  - Not a single company bill
  - Could be expensive to fix
  - Could be administratively burdensome





- 50% reduction in cycle time and 30% reduction in cost of ownership will come from integration
- How to pay for it?

Recommendations

- Productize SMART in ACAT I and II Programs
- SMART/SBA as a Decision Component in P3I Prioritization
- Prototype 1-4 high payoff candidates, ***then*** Incorporate SMART/SBA as a Contract Provision in the Proposed Effort
- Cost share the application of SMART/SBA between Government and Industry

Areas for Further Exploration

- Logistics System Modeling
- Integration of Program M&S with Information Systems Modeling (C4ISR, JTA-A, Army Enterprise Strategy)
- SMART as a Complement to Spiral Development
- SMART used to Reduce Test and Evaluation (virtual testing)
- Integration of SMART into Army & DoD Cost Models (POM Builds)
- SMART use of Process and Data Models
- HTI Validation through the use of SMART

"If you can't do it with brainpower, you can't do it with manpower - overtime." Kelly Johnson, F-16 & SR71 System Architect